

Model Application and Decision Making in Tana Sub-Basin

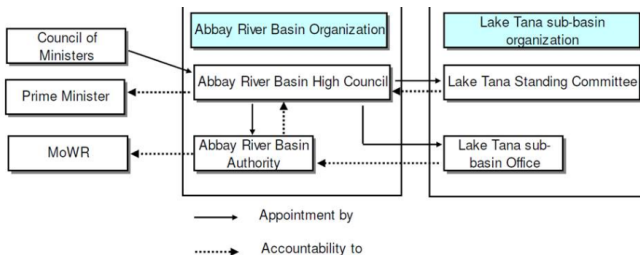
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IWNI NBDC Hydro-Modeling Symposium November 12, 2012,
ILIRI Campus, Addis Ababa.

Outline of talk

- 1 Abbey Basin Authority-Tana Sub-Basin Org. and RBOs
- 2 Modeling in TaSBO
- 3 Modeling Tools Implemented in TaSBO
- 4 Issues in modeling for TaSBO
- 5 GIS-RS Modeling
- 6 Integration Requirement for Erosion Modeling Para Dime Shift in Finding the BMP:

Abbay Basin Authority-Tana Sub-Basin Org. and RBOs



Functions of Abbey Basin Authority

- Policy guidance
- Directing preparation of the River Basin Plan
- Making proposals to Government on the rates of water charges
- Examining and deciding on water allocation rules and principles
- Managing water use disputes between stakeholders
- Providing information to the concerned bodies in charge of discussions with neighbouring

Modeling in TaSBO

The use of models

- For evaluation and improvement of the Reliability of the hydrological data
 - In data generation and calibration of hydrological data
 - Fill the gaps, in the previous data
 - Predict the future condition
- For Simulation and Scenario analysis of hydrological data

Modeling in TaSBO

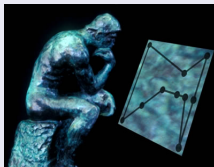
Application areas of Models in TaSBO

- Demand Side Study the Sectors assessment
 - Water Allocation Model-Water Resources Planning and Management
- Supply side study Water Resource assessment
 - Hydrologic system simulation
- Strategic Development Planning
 - Integration of the above models
 - Strategic social and environmental assessment
 - Visualization and Scenario Analysis to Decision Making by decision makers

Modeling in TaSBO

The challenges of modeling in TaSB

- Massive intervention in land and water resources use
 - The future will be quite different from the present, and prediction is quite complex
 - Change in Water use behavior
 - Land use pattern change
 - Associated Erosion pattern change
 - Climate change
- Requirement of system thinking and Integration of models
- Technical capability
 - Limited number of modelers
 - Limitation in the tools



Modeling Tools Implemented in TaSBO

The Tana Beless DSS: A database based model

- Flow measurements at micro-catchment level (25 watersheds)
- Establishment of time series water quality data bases on Rivers and the Lake
- Establishment of time series groundwater
 - Levels fluctuation
 - Groundwater quality variation

Modeling Tools Implemented in TaSBO

The Tana Beless DSS: A database based model

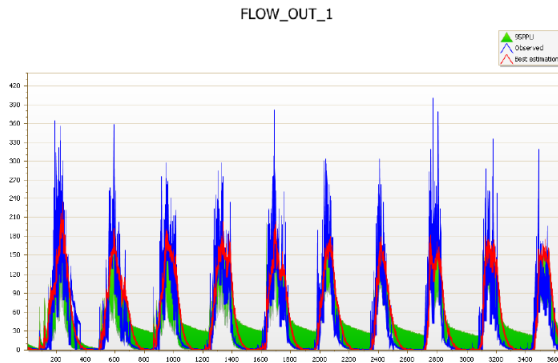
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SWAT

- Generation of stream flow data,
 - Older sources are relatively in good quality for use in various purposes
 - Interim data is not in a reliable situation
 - Current and future measurements installation is on progress
 - Near/far Future== Requires Prediction
- SWAT is being used in
 - Filling gaps of data quality
 - Predict the future, in association with climate model

Modeling Tools Implemented in TaSBO

SWAT in Gilgel Abbay flow simulation: **Poorly Simulated**



Modeling Tools Implemented in TaSBO

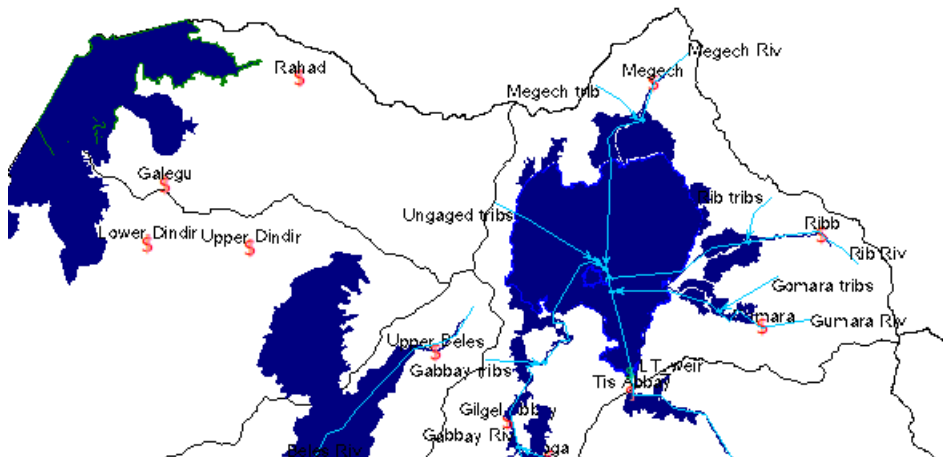
WEAP/Mike Basin?

Primarily interest for **Sectors demand analyses**

- Reservoir operations (balance between sectors and ecology)
- The potential for substitution among water uses
- The potential for substitution among water saving
 - Rain water management
 - Flood management
 - Groundwater use/conjunctive

Modeling Tools Implemented in TaSBO

WEAT, Schematic on progress



Modeling Tools Implemented in TaSBO

Groundwater flow and contaminant transport modeling (MODFLOW)

- This Under construction
- Conceptual model==flow from the basin to the Beless basin

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GIS-RS Modeling

- Ex: Vegetation dynamics in Tana Basin

Issues in modeling for TaSBO

- Selection of better modeling tools
- Improved the modeling capability of professionals
- Consistency with the use of the selected model
- Continuous Updating of the models
- More on integration of socio-economic conditions for various scenarios analysis
- In-depth Integration of hydrological modeling with other disciplines
 - Ex:Ex: Geology and Gully erosion/ Slope Failure/ Small Scale Land Slide
- Water quality is an issue now and more in the future
- Integration of Socioeconomic and Environmental models for Administrative purpose = System Dynamics Modeling

GIS-RS Modeling

Vegetation dynamics (trend)

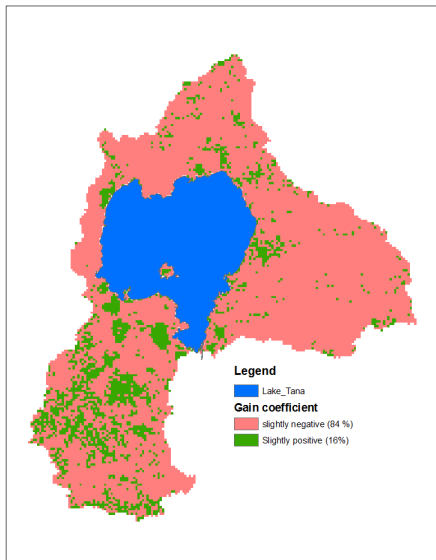
- MODIS satellite NDVI image of growing season monthly vegetation peak between 2001 and 2010 were analyzed
- Explained by linear relation

$$Y = aX + b \quad (1)$$

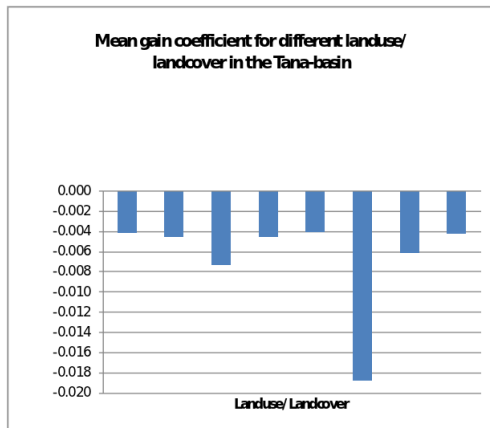
where a is the Gain Coefficient (**slope**) of NDVI

- $a > 0$, increasing trend
- $a = 0$, no change
- $a < 0$, decreasing trend

Vegetation dynamics in Tana Basin, slope



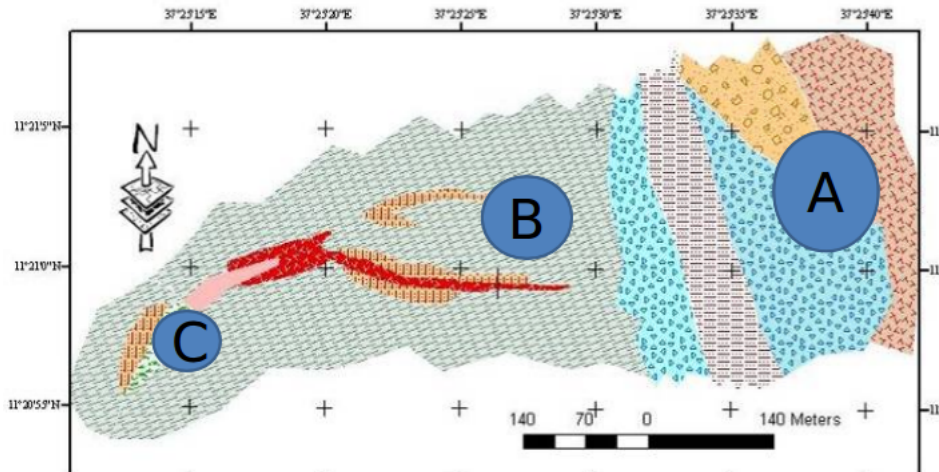
Wetland-Biomass Showing Slightly Decreasing Trend

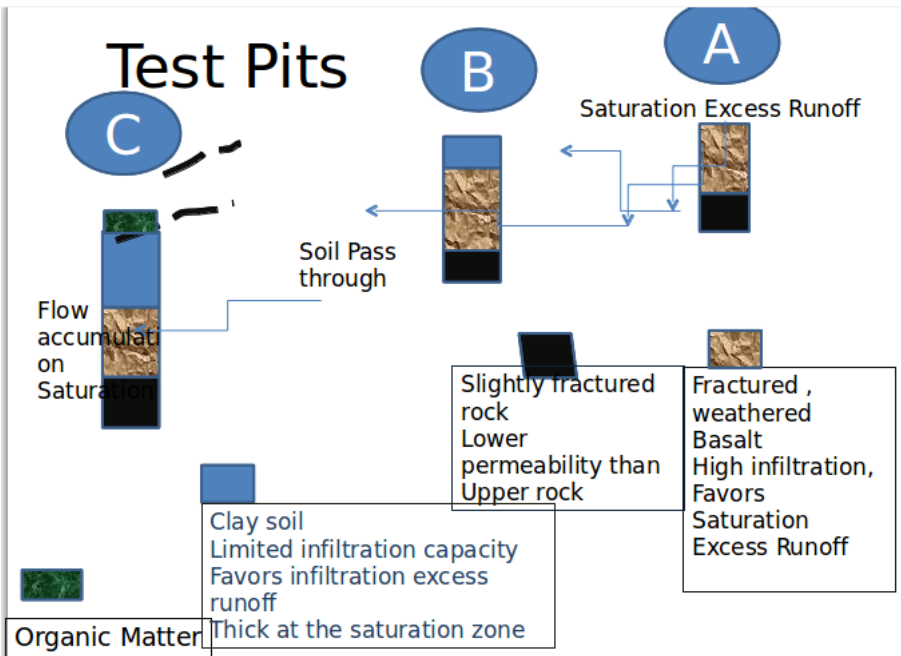


This is supported with field visit and community say

Shift in Finding the BMP:

The Debremawi Watershed/ soil





Description of Slope Classes

Upper slope class

- Exposed weathered rock
- In the near past it has been covered by clay soil (community),
- Prologue agricultural practice, with no management
- Source of rill/sheet erosion in the past
- It has been source of infiltration excess runoff in the past
- No longer used for cultivation, exposure of rock
- Now it is recharge zone, with saturation excess runoff

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Middle slope class

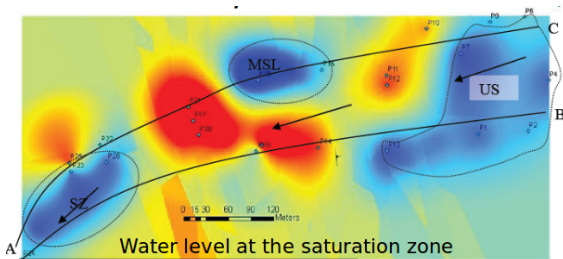
- Covered by clay Soil
- Pizometric water is above the ground,
- The land mass is stable
- At gully bottoms there are ephemeral springs
- It is the source of infiltration excess runoff
- Largest area coverage of the watershed
- It is crop land

Description of Slope Classes

Down Slope

- Has been wet land in the past
- Accumulation of water recharged from the upper slope
- This flow accumulation is larger than ever before, the recharge volume from the recharge zone is higher now
- Huge slide of the land mass

Water Level Map



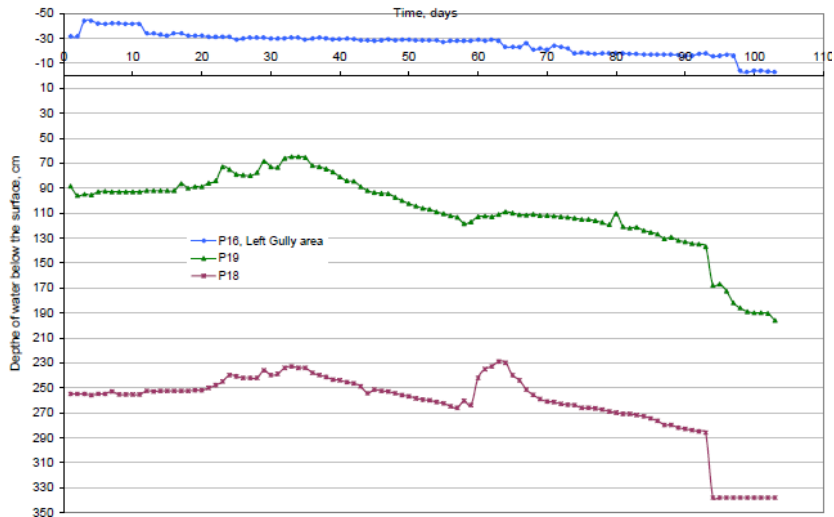
Water level at the saturation zone

Above the ground before sliding
 Decline immediately after the first sliding event
 With more rainfall, the recharge volume increase
 Followed by associated slope failure

Decline in the water levels after sliding event



Pictures at the saturation zone

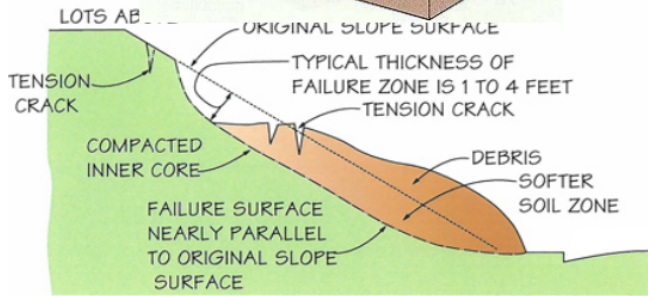
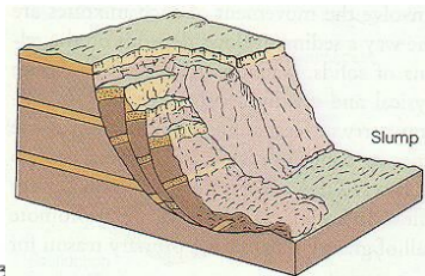


More important: succession of slope failure in associated to the slides

Sequence of Failure Plains



Sequence of Failure Plains



Conclusion

- It is important Prioritizing the location for erosion control
- Increasing recharge in the upper slope causes more land slide
- What is being done in the watershed is massive soil and water conservation practice?????
- The future direction is to study in Geotechnical Modeling

What will be the impact of Upland Soil And Water Conservation Practice?

- Would It Enhance Recharge?

Right or Wrong?

Thank You,